A critical appraisal of "Whole-body vibration improves ankle spasticity, balance, and walking ability in individuals with incomplete cervical spinal cord injury"

By

PAT UDOFIA, SPT

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Department of Physical Therapy

Angelo State University

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Abstract

The clinical question being researched was focused on the benefits of whole body vibration in spinal cord injury patients. This term paper was written to critically appraise the article titled, "*Whole-body vibration improves ankle spasticity, balance, and walking ability in individuals with incomplete cervical spinal cord injury***"** which answered the initial clinical question directly. A brief research was conducted to find this article which explained a double-blinded, randomized clinical trial conducted in South Korea analyzing the differences between two groups (intervention vs. control) using whole body vibration as the intervention. The structure and method of conducting the research study were very clearly stated and could easily be replicated, referencing numerous credible literatures. There were few weaknesses in the study, such as the somewhat high attrition rate and lack of a hypothesis given, but overall the research paper showed how valuable this intervention could be to the PT world in treatment of those with incomplete spinal cord injuries. The authors then went on to encourage further research on the topic, and humbly addressed their own limitations/weaknesses that might have occurred in their study.

Key words

Vibration, therapy, spinal cord injury

Introduction

The clinical question I was interested in researching was as follows: Does whole body vibration (WBV) therapy have any benefits for patients who have suffered spinal cord injuries? The population in question was patients who have suffered spinal cord injuries. The intervention, as stated, was whole body vibration therapy and how its benefits compare to those of traditional neurological physical therapy.

Methods

The databases I used to conduct my research were CINAHL and PubMed (National Library of Medicine). The keywords for my search were vibration, therapy, and spinal cord injury. The limits placed on my research included free full text, English, and results within the last 15 years. The inclusion criteria included randomized trial, spinal cord injuries, whole body vibration, and systemic reviews were excluded. I chose this criteria in order to eliminate bias as much as possible, and keep search results specific and pertaining to the topic I aimed to examine. I had a total of 44 hits after narrowing down the results.

The researchers conducted a randomized, double-blind clinical trial to analyze the benefits of whole body vibration on those with incomplete spinal cord injuries. All procedures were performed in Seoul, South Korea. The following **inclusion** criteria were used: diagnosed with cervical level 6 or 7 iSCI, onset of greater than or equal to 6 months, American Spinal Injury Association Impairment Scale grade D motor and sensory scores, ability to stand for at least 5 mins, ability to understand and follow verbal commands, medical referral by a physician for physical therapy, ability to complete the designed WBV training session. Patients with pre-existing neurological disorders, progressive SCI, brain injury, cardiopulmonary complications, or other concurrent medical conditions as well as those taking medication that could interfere with

postural control were **excluded**. Patients were all randomly assigned to either the WBV group or the control group (16 each). The same blinded evaluator measured data both before and after the 8 week training. Both groups received conventional physical therapy in addition to 16 minutes of WBV training, twice a day, 5 days a week for 8 weeks for the WBV group and placebo-WBV training without vibration for the control group. The results and conclusion showed that WBV is a safe and effective intervention for those with incomplete spinal cord injuries. While both groups showed improvement from the conventional physical therapy provided, the WBV group had much larger and significant improvements in spasticity, postural sway, balance, and gait ability. I chose this article because I found it to be the most relevant to my question and clinically useful. In addition, it was a randomly assigned, double-blinded experiment in which all subjects had similar sociodemographic, clinical, and prognostic characteristics and were all managed in the same way. The experiment also utilized reliable, valid, and proven tests for outcome measures that have been used by researchers and clinicians for years. All of these attributes prove this study to be reliable and valid enough for me to share with my classmates in addition to its clinical significance.

Results

Summary of the study

The researchers conducted a randomized, double-blind clinical trial to analyze the benefits of whole body vibration on those with incomplete spinal cord injuries. All procedures were performed in Seoul, South Korea. Patients were all randomly assigned to either the WBV group or the control group (16 each). The same blinded evaluator measured data both before and after the 8 week training. Both groups received conventional physical therapy in addition to 16

minutes of WBV training, twice a day, 5 days a week for 8 weeks for the WBV group and placebo-WBV training without vibration for the control group. The results and conclusion showed that WBV is a safe and effective intervention for those with incomplete spinal cord injuries.

Appraisal of the study introduction

Overall, the introduction of the article was organized very well. It was comprehensive, provided enough background information and addressed the critical variables in the experiment. All of the literatures provided were current and all from primary sources of credible journals.

The only weakness I saw in the introduction was a lack of a thorough explanation of the intervention being used. Being an SPT with prior experience using vibration plates with patients with spinal cord injuries, I immediately understood what the authors were referring to. However, if I was a therapist from another focus, or just someone interested in learning more about whole body vibration, I could not have understood how the intervention worked from the descriptions given in this article. Also, the Wirth et. al study (2013) that was referenced was about the effect of WBV on rats and a reader could potentially question how relevant this information would be to humans.

Appraisal of the study methods

The study had very minimal bias due to the experimental, prospective, longitudinal, and double blinded research design. The study involved a control group and an intervention group in a between-subjects study. The groups had similar sociodemographic, clinical, and prognostic characteristics at the start of the study, and the investigators treated both groups the same in

every way besides the intervention given. The instruments and outcome measures used in the study were all described in sufficient detail and supported by appropriate, cited evidence. The study could very easily be replicated by someone who is already familiar with the intervention, as frequency, duration, and other details are all listed clearly. The procedure of data collection was clear, in detail, and could very easily be replicated. The statistical analyses proved the study was significant and not by chance.

One weakness in the study was the attrition. In the study, 38 were recruited and 28 participated in and completed the study. 4 subjects were dropped prior to the study because they didn't meet inclusion criteria, while 2 more dropped out by personal choice prior to intervention as well. The study began with 32 participants and 4 were dropped (2 from each group) due to discharge, leaving the final 28 that completed the study. This large decrease in sample size could make the study a bit less valid simply because every human being is unique and this could reduce the probability of outliers in the study. Another potential weakness was the lack of an explanation/justification of the statistical analyses used. I was not familiar with either of the analyses and it was not explained to readers at all.

Appraisal of the study results

The results section of the study was organized very well and the authors made sure to compare every dependent variable in question between groups and even in the same order as it was presented. The results clearly address the research question and aim of the study. All outcome measures reported in the methods were reported in the same order, and most figures and tables are presented clearly, accurately and make sense. The threshold p value the authors were using to show statistical significance was clearly stated as .05 and results that were deemed statistically significant were identified. I, based on my current knowledge, would consider these results to be clinically significant as well. I believe these

results prove that this intervention would be a very valuable and reliable option for patients with incomplete spinal cord injuries. I also found it very helpful that the authors added symbols to their table with a key to symbolize values of significance/clinical importance. No hypothesis is given, and I believe this could mean the authors have absolutely no bias towards one result vs. the other, but would not necessarily lessen the value of the study in any way.

However, in Table 1, it was not very clear what units/values were being used for the "Time x Group Interaction" column. Also, some professionals (including myself) know the acronym 10MWT to mean 10-minute walk test, so they should clarify that it is the 10-*meter* walk test they are utilizing instead. It wasn't until the reader reaches the walking test portion of the Methods that this becomes evident. Also, confidence intervals, minimal clinically important difference (MCID), and number needed to treat (NNT) were all not used at all in the study, which could slightly lessen the value of the study results. Furthermore, no hypothesis is given. This could show a lack of focus by the authors, but wouldn't take away from the validity of the study.

Appraisal of the study discussion

The authors made sure to indicate the meaning of the findings and how it could benefit this patient population and even compared it to other literature that had similar findings. They compared and contrasted their findings to multiple existing literatures giving due credit to all other authors. The limitations of the study are listed and recognized by the authors at the end of the study. (Only patients with a limited cervical level of spinal cord injury were examined, a rather small sample size was used, and only one frequency was used (30 Hz)). The conclusions given are reflective of results observed in the study, I don't believe the authors "over concluded" at all. The authors suggested that future

researchers try a similar study comparing the results of different frequencies of vibration and amplitudes instead of just one utilized in this study. It is also mentioned in the Discussion section that another study found 45 Hz to be the optimal frequency for patient benefit, as opposed to this study which used 30 Hz – the more common clinical value. The authors wrapped up by once again addressing clinical significance and how useful of an intervention this could be to someone in this patient population, or those working to treat them.

Some of the findings were simply restated in the Discussion without explaining the meaning of these results. Also, the Wirth et. al study (2013) that was referenced was about the effect of WBV on rats and a reader could potentially question how relevant this information would be to humans.

Discussion

This study is very clinically significant specifically in neurological PT, as a large proportion of those patients are those with spinal cord injuries, and this study shows specific benefits they could see with both traditional PT alone and whole body vibration therapy. This study virtually directly answers the clinical question I was initially interested in researching by not only showing that there is a benefit of whole body vibration in these patients, but it even lists specific attributes that improve.

I believe this intervention is very useful and should be implemented in treatment for incomplete spinal cord injuries when possible. I think it is well worth the risk of possible patient discomfort to elicit these benefits for the patients and I believe it would improve the quality of their therapy sessions as a whole.

I do have enough confidence in the research validity of this study to use it on my future patients/clients because for one I have prior experience with the intervention, and secondly the

results are validated by statistical analysis. Seeing the way that this WBV therapy benefits this patient population, I would use it to begin a therapy session and I believe it would improve their functionality during the session greatly.

Overall, I think this was a great research paper exemplifying the value of whole body vibration (WBV) therapy in the treatment of those with incomplete spinal cord injuries, and the various benefits that could be elicited from it.